

**RECYCLING OF INDUSTRIAL EFFLUENT FROM AUTOMOBILE
INDUSTRY THROUGH ULTRA FILTRATION AND REVERSE
OSMOSIS**



INTERNSHIP REPORT

**Company : Aqua Engineers and consultants private
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PROGRAM : CHEMISTRY
YEAR : 2020-2022



Aqua Engineers and Consultants India Pvt Ltd
(An ISO 9001 : 2015 Certified Company)
Innovative Technologies For Sustainable Solutions...

09-02-2022

CERTIFICATE

This is to certify that **Mr.K.DEVAIAH (40910015)**, a student of **M.Sc. Chemistry**, Department of Chemistry, Sathyabhama Institute of Science and Technology, Chennai has carried out his work entitled **“Recycling of Industrial Effluent from Automobile Industry through Ultra filtration & Reverse Osmosis”** as a part of summer internship Project for the Degree of **M.Sc. Chemistry**. The work was done at **Aqua Engineers and Consultants India Private Ltd** under my supervision from **24th January 2022 to 4th February 2022**.

For Aqua Engineers and Consultants India Pvt Ltd

K.JAYARAM

Managing Director



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Score	Type of Certificate
>=90	Elite+Gold
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for successfully completing the course

Organometallic Chemistry

with a consolidated score of **47** %

Online Assignments	11.25/25	Proctored Exam	36/75
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Total number of candidates certified in this course: **108**

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(4 week course)

Prof. Sridhar Iyer
Head CDEEP & NPTEL Coordinator
IIT Bombay



Indian Institute of Technology Bombay



Roll No:NPTEL22CY01S43312159

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AIM:

To recycling of industrial effluent from automobile industry through ultrafiltration and reverse osmosis.

About company

- Aqua Engineers and Consultants India Private Limited is Total Water Management Company with engineering capabilities to undertake and execute turnkey solutions for water and wastewater management.
- Aqua Engineers commitment to the environment, keeps it in the forefront of product innovations, purification and recycling technologies.



Specialties

- Water Treatment Plant, waste water treatment Plants, Zero Liquid Discharge System, and Sewage Treatment Plants

Reverse osmosis

- Reverse osmosis (RO) is a water purification process that uses a partially permeable membrane to separate ions, unwanted molecules and larger particles from drinking water.

- Applying an external pressure to reverse the natural flow of pure solvent,
- Applying an external pressure to reverse the natural flow of pure solvent, thus, is reverse osmosis.
- In the normal osmosis process, the solvent naturally moves from an area of low solute concentration, through a membrane, to an area of high solute concentration.
- The driving force for the movement of the solvent is the reduction in Gibbs free energy of the system when the difference in solvent concentration on either side of a membrane is reduced, generating osmotic pressure due to the solvent moving into the more concentrated solution.
- Applying an external pressure to reverse the natural flow of pure solvent, thus, is reverse osmosis. The process is similar to other membrane technology applications.
- Reverse osmosis differs from filtration in that the mechanism of fluid flow is by osmosis across a membrane.
- The predominant removal mechanism in membrane filtration is straining, or size exclusion, where the pores are 0.01 micrometers or larger, so the process can theoretically achieve perfect efficiency regardless of parameters such as the solution's pressure and concentration.
- Reverse osmosis instead involves solvent diffusion across a membrane that is either nonporous or uses nanofiltration with pores 0.001 micrometers in size.
- The predominant removal mechanism is from differences in solubility or diffusivity, and the process is dependent on pressure, solute concentration, and other conditions.

- Reverse osmosis is most commonly known for its use in drinking water purification from sea water, removing the salt and other effluent materials from the water molecules

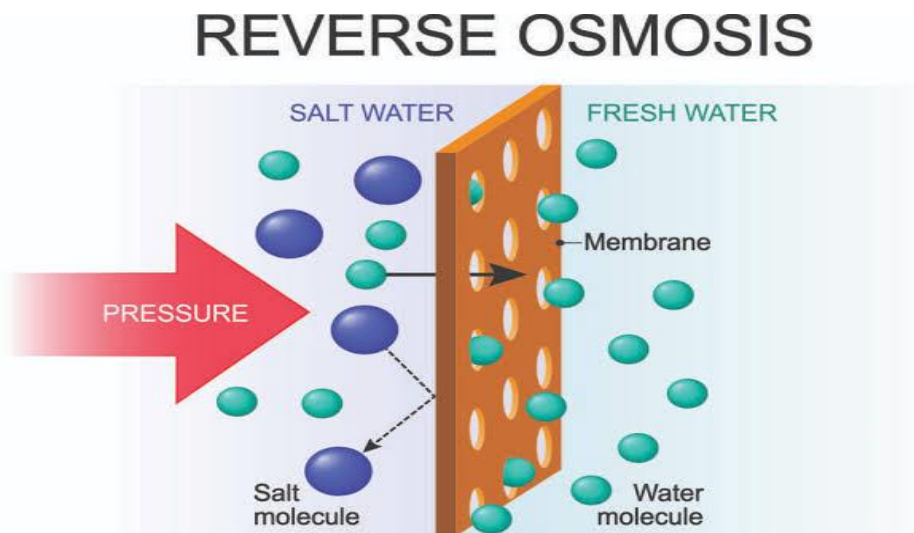


Figure : Reverse osmosis

Membranes

- Reverse osmosis (RO) membranes play a key role in wastewater treatment units as they are used to remove salts and other pollutants effectively.
- RO membrane performance is affected by many different factors such as feed characteristics and operational parameters during operation.

TDS

- Total dissolved solids (TDS) are the amount of organic and inorganic materials, such as metals, minerals, salts, and ions, dissolved in a particular volume of water;

- TDS are essentially a measure of anything dissolved in water that is not an H₂O molecule.
- Since it is a solvent, when water encounters soluble material, particles of the material are absorbed into the water, creating total dissolved solids.
- TDS in water can come from just about anywhere, including natural water springs, chemicals used to treat the municipal water supply, runoff from roads and yards, and even from your home plumbing system.



Types of total dissolved solids (TDS)

- Calcium
- Chloride
- Magnesium
- Potassium
- Zinc
- Aluminum
- Copper
- Lead
- Arsenic
- Iron
- Chlorine
- Sodium
- Fluoride
- Bicarbonates
- Sulfates
- Pesticides
- Herbicides

Ultrafiltration

- Ultrafiltration (UF) is a variety of membrane filtration in which forces like pressure or concentration gradients lead to a separation through a semipermeable membrane.

- Ultrafiltration is not fundamentally different from microfiltration. Both of these separate based on size exclusion or particle capture.

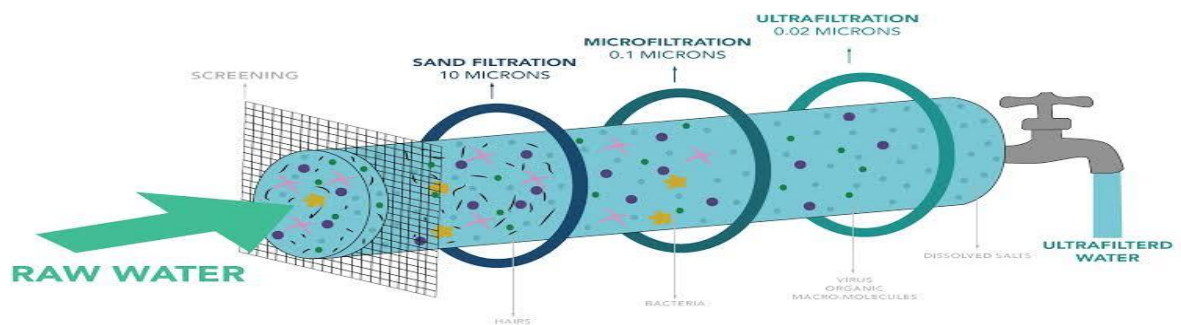


Figure : filtration of water at different microns.

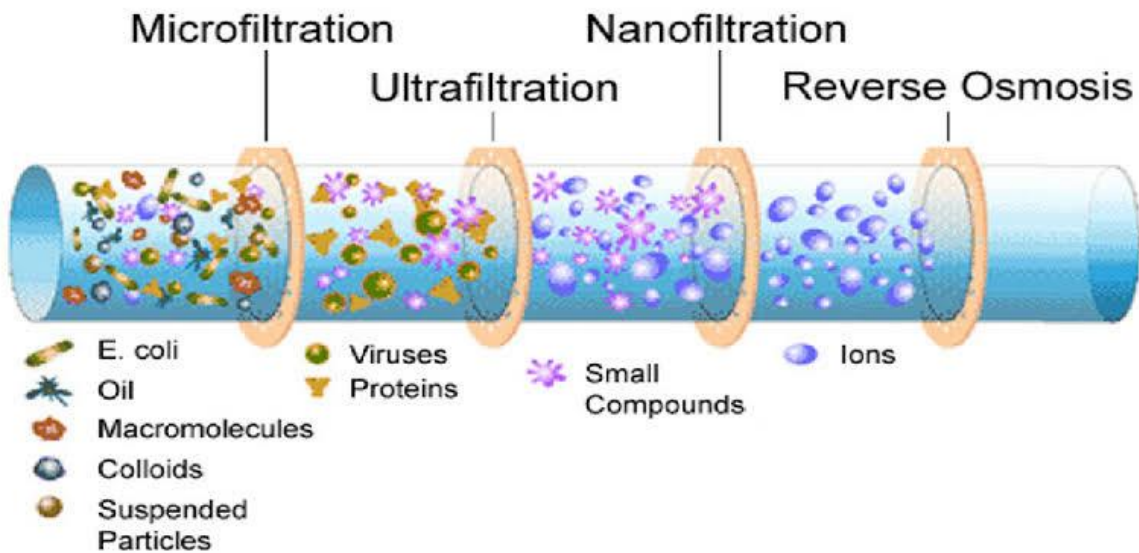


Figure : Diffetent types of filtrarions

- RO and UF are both membranes. The difference between the two is in the size of the filtering holes.
- In an RO membrane the filtering holes are so small that it can even filter out salt molecules from the water.
- In the UF membrane the holes are larger and so it cannot filter out salt molecules.

CONCLUSION :

- Recycling of industrial effluent was recycled by using ultrafiltration and reverse osmosis to reduce the cost and expecting the high efficiency.
- Reverse osmosis and ultrafiltration process made work easy for recycling the water in many industries only the need is particular sized membranes in microns level
- These methods are very effective nowadays to recycling their company wastage and these methods are not dangerous but these are eco-friendly when we are using in moderate conditions.